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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/575,298	05/19/2000	Peter Elenius	5833-A-11	1299

7590

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EXAMINER

PAREKH, NITIN

ART UNIT

PAPER NUMBER

2811

DATE MAILED: 01/28/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.
09/575,298

Applicant(s)
Elenius et al

Examiner
Nitin Parekh

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on Oct 24, 2002
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 16-22 is/are pending in the application.
- 4a) Of the above, claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 16-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
*See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s). 2 and 6 6) ☐ Other: _____

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DETAILED ACTION

Claim Rejections - 35 USC §.112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 16 and dependent claims 17-22 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

3. Claim 16, lines 15 and 19 cite: ".....a mass of low melting temperature reflowable solder having".

However, the description in the specification (pages 1-11) does not disclose the solder bar or the mass of the solder bar being made of a low melting temperature reflowable solder.

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4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claim 16 and dependent claims 17-22 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 16, lines 20 and 21 cite: "...a mass of low melting temperature reflowable solder having a lowermost base region, the width of the lower most base region of the solder mass along the solder pad being substantially equal to solder bar pad width BW."

However, it is not clear from the description in the specification and Figures which portion of the solder is "lowermost or lower most base region along the solder pad" being claimed to have substantially equal width.

6. Claims 17-22 recite the limitation "The apparatus" in a first line respectively.

There is insufficient antecedent basis for this limitation in the claims.

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Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 16-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dockerty et al (US Pat. 5796169) in view of Jonaidi (US Pat. 6091155), Lee et al (US Pat. 6050832), Barrow (US Pat. 6118182) and Thompson (US Pat. 5011066).

Regarding claim 16, Dockerty et al disclose a device/apparatus comprising a reflowable/composite solder bar/support formed on an upper surface of a first substrate (Flip chip device 3 in Fig. 3 and 4), the substrate having a first electrical contact and the reflowable/composite solder bar/support being adapted to join the first electrical contact to a second electrical contact on a second substrate (1 in Fig. 1-5), the solder bar/support comprising in combination:

a) a first conventional circular solder pad (4 in Fig. 3 and 4) formed on the upper surface of the first substrate, the pad having a center and first predetermined diameter/D

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- b. a second conventional circular solder pad (4 in Fig. 3 and 4) formed on the upper surface of the first substrate, the pad having a center and first predetermined diameter/D, the center of the second pad being spaced from that of the first pad by a predetermined spacing/distance/BL (see the solder bar/support connecting the first and second pads in second column in Fig. 3)
- c. a solder bar pad of first predetermined width/BW (15 in Fig. 4) formed on the upper surface of the first substrate connecting the first and second circular pads, BW being approximately equal to or slightly less than D (Fig. 4)
- d. a mass of reflowable/composite solder comprising high melting temperature(HMT)/low melting temperature (LMT) solders and having a volume/VB formed on the first and second conventional circular pads/solder bar pad to form the reflowable/composite solder bar/support (16/20, 17/20, 18/20 and other bars/supports connecting two or more pads etc. in Fig. 3 and 4) reaching a height H1 and H2 above the centers of the first and second pads and the midpoint of the solder bar/support respectively (16, 18, etc. in Fig. 4)
- e. values for predetermined D, BL, BW are such that H1 is approximately equal to H2 (Fig. 3 and 4; Col. 4, line 50-65), and
- f. solder bumps/balls (Fig. 4; Col. 4, line 53) having spherical/circular shape having a height H3 where H3 is approximately equal to H1 and H2.
(Fig. 1-5; Col. 2-5).

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Dockerty et al disclose H1 and H2 being equal (same as the diameter of bump 11; Fig. 4) but fail to specify:

- a) the value of BW being less than D and
- b) the solder bump diameter (D_c)/volume (V_c) being such that D is in a range of D_c - $2D_c$ or V_B is in a range of $2V_c$ - $5V_c$ respectively and (H_2-H_1) being less than 5% or 10% of H_2 .

a) Jonaidi teaches using conventional pad/trace design where the solder pad/trace width/BW is less than the diameter/D of the circular pads (width of 20 and pads 18/14 in Fig. 1A/1B; Col. 1 and 2).

Lee et al teach using conventional pad/trace design where the solder pad/trace width/BW is less than the diameter/D of the circular pads (width of 233 and pads 228/230 in Fig. 3A and 4B-8; Col. 7 and 8).

b) Furthermore, determination of parameters including solder pad, solder bar/support, fillet, solder bump, etc., their respective values/range of dimensions such as D, H1, H2, BW, BL, solder bump volume/ V_B etc., shape, number, spacing, etc. in chip packaging and interconnection technology art is a subject of routine experimentation and optimization to achieve the desired solder bonding strength, solder joint integrity/yield and reliability.

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Barrow teach using a solder joint/bar (26 in Fig. 5) where the solder joint/bar width is less than that of the rectangular pad (pad 18 in Fig. 5).

Thompson teaches using a flattened solder mass/joint (206 in Fig. 2C) having different profile/values for H1, H2 and H3 and the solder mass/joint volume/VB being higher than that of conventional solder bump/VC.

Therefore, it would have been obvious to a person of ordinary skill in the art at the time invention was made to select the low melting temperature reflowable solder bar comprising the above elements a) and b) so that the solder joint strength, integrity/yield and reliability can be improved using Jonaidi, Lee et al, Barrow and Thompson's solder bar/pad structures in Dockerty et al.

Regarding claim 17, as explained above for claim 16, Dockerty et al in view of Jonaidi, Lee et al, Barrow and Thompson teach selecting H1 and H2 being approximately equal to a height of the conventional solder bumps H3.

Regarding claim 18, as explained above for claim 16, Dockerty et al in view of Jonaidi, Lee et al, Barrow and Thompson teach selecting a range of D being $D_c - 2D_c$.

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Regarding claim 19, as explained above for claim 16, Dockerty et al in view of Jonaidi, Lee et al, Barrow and Thompson teach selecting VB being in a range of $2V_c$ - $5V_c$.

Regarding claim 20, as explained above for claim 16, Dockerty et al disclose the first substrate being a flip chip IC.

Regarding claim 21, as explained above for claim 16, Dockerty et al in view of Jonaidi, Lee et al, Barrow and Thompson teach selecting a value (H_2-H_1) being less than 10% of H_2 .

Regarding claim 22, as explained above for claim 16, Dockerty et al in view of Jonaidi, Lee et al, Barrow and Thompson teach selecting a value (H_2-H_1) being less than 5% of H_2 .

Response to Arguments

9. Applicant's arguments filed on 10-24-02 have been fully considered but they are not persuasive.

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A. Applicant contends that Jonaidi's teaching is inconsistent with that of Dockerty et al.

However, as explained above, Jonaidi's conventional pad/trace design having BW being less than the D is applied to Dockerty et al's solder pad structure.

B. Applicant contends that Barrow lacks solder bar pad.

However, as explained above, Barrow's teaching using a solder bar structure having a dog-bone type shape where the solder bar width is less than that of the pad is applied to Dockerty et al.

Papers related to this application may be submitted directly to Art Unit 2811 by facsimile transmission. Papers should be faxed to Art Unit via Technology Center 2800 fax center located in Crystal Plaza 4, room 4C23. The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG 30 (15 November 1989).


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nitin Parekh whose telephone number in (703) 305-3410. The examiner can be normally reached on Monday-Friday from 08:30 am-5:00 pm.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas, can be reached on (703) 308-2772. The fax number for the organization where this application or proceeding is assigned is (703) 308-7722 or 7724.

Nitin Parekh

01-25-03



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